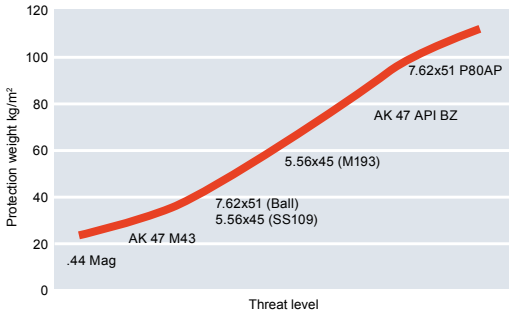


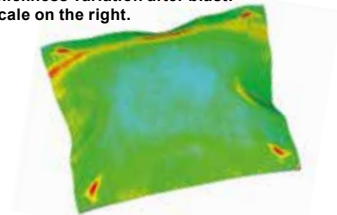
# RAMOR® 500 AND RAMOR® 400 PROTECTION STEELS FOR THE ADVANCED SAFETY OF LIFE AND PROPERTY

## WEIGHT OF BALLISTIC PROTECTION RAMOR® 500



## BLAST EFFECTS TESTING. 3D LASER MEASUREMENT RAMOR® 400. NOMINAL THICKNESS 12MM.

Thickness variation after blast. Scale on the right.



After blast, minimum thickness measured >12.0 mm. Pressure proof, no significant damage.

## TYPICAL MECHANICAL PROPERTIES

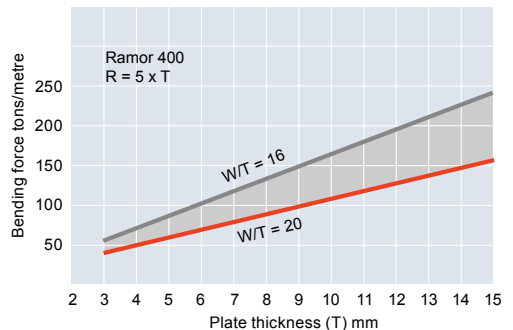
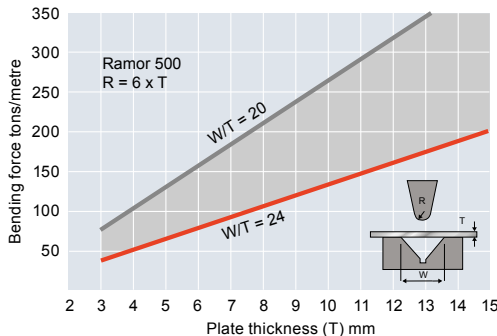
Ruukki Ramor	Yield strength $R_e$ MPa	Tensile strength $R_m$ MPa	Elongation $A_5$ %	Hardness HBW	Impact strength all directions $t$ °C	Charpy V J
Ramor 400	1100	1300	8	360-450	-40	20
Ramor 500	1450	1700	7	480-560	-40	20

## THICKNESS AND THICKNESS TOLERANCES (LOWER TOLERANCES = 0.00)

Heavy plates	
Thickness (mm)	Upper tolerance (mm)
6.00 – 6.99	+0.74
7.00 – 7.99	+0.76
8.00 – 9.99	+0.80
10.00 – 11.99	+0.90
12.00 – 14.99	+1.00
15.00 – 19.99	+1.10

Sheets	
Thickness (mm)	Upper tolerance (mm)
2.50 – 3.00	+0.32
3.01 – 4.00	+0.36
4.01 – 5.00	+0.40
5.01 – 6.00	+0.42
6.01 – 6.50	+0.44

## BENDING FORCE. R=MINIMUM RECOMMENDED BENDING RADIUS, W=DIE OPENING WIDTH (mm)



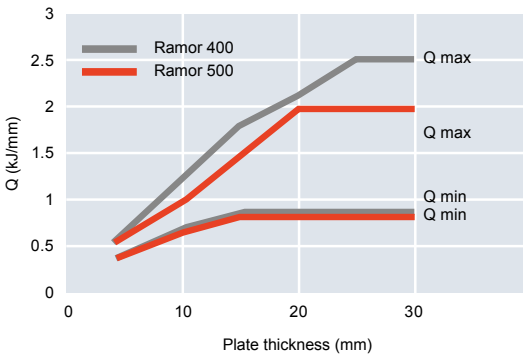
## UNDERMATCHING WELDING CONSUMABLES

Welding method	EN Classification	AWS Classification	Consumables (Esab)	Type
GMAW, Solid wire	EN 440 G3Si1	AWS A5.18 ER70S-6	OK Autrod 12.51	Ferritic
SMAW, electrode	EN 499 E 42 4 B 42 H5	AWS A5.1 E7018	OK 48.00	Ferritic
GMAW, solid wire	EN 12072 G 18 8 Mn	AWS 5.9 ER307	OK Autrod 16.95	Austenitic
SMAW, electrode	EN 1600 E 18 8 Mn B 4 2	AWS 5.4 E307-15	OK 67.45	Austenitic

### BUTT WELDING. PREHEATING / WORKING TEMPERATURE. VALID FOR UNDERMATCHING FERRITIC CONSUMABLES, HYDROGEN CLASS ≤ H5.

	Plate thickness mm		
	10	20	30
Ramor 400	+20°C	+75°C	+100°C
Ramor 500	+20°C	+100°C	+150°C

### HEAT INPUT (Q) RANGES FOR BUTT JOINT. PREHEATING ACCORDING TO THE ADJACENT TABLE



#### SAFETY AT WORK

The safety instructions must be adhered to in detail in all workshop processing of high hard armoured steels.



### RAMOR® 500 – CERTIFIED PLATE THICKNESSES AND DEGREES OF PROTECTION

Standard/ Norm	Protection level	Threat	Bullet weight (grams)	Distance (meters)	Striking velocity (m/s)	Recommended minimum thickness (mm)
EN1522	FB4	.44 Magnum	15.60	5	440±10	3.00
PM 2007	Class 4	.357 Magnum	10.20	5	430±10	
EN1522	FB4+	7.62 x 39mm AK-47 (M43)	8.00	10	720±10	4.25
PM 2007	Class 6					
EN1522	FB6	5.56 x 45mm SS109 (M855)	4.00	10	950±10	6.50
PM 2007	Class 7	7.62 x 51mm Nato Ball	9.55	10	830±10	
EN1522	FB7	7.62 x 51mm P80 Nato AP	9.45	10	820±10	14.20
PM 2007	Class 9					

### CUSTOMER SERVICE

For further information, please contact our Technical Customer Service or visit [www.ruukki.com](http://www.ruukki.com).

Ruukki provides its customers with energy-efficient steel solutions for better living, working and moving.

This publication is accurate to the best of our knowledge and understanding. Although every effort has been made to ensure accuracy, the company does not assume any responsibility for any errors or omissions, or any direct, indirect or consequential damage caused by incorrect application of the information. We reserve the right to make changes. Always use original standards for accurate comparison.



Ruukki Metals Oy, Suolakivenkatu 1, FI-00810 Helsinki, Finland, +358 20 5911, [www.ruukki.com](http://www.ruukki.com)  
Copyright© 2012 Rautaruukki Corporation. All rights reserved. Ruukki, Rautaruukki, Living. Working. Moving. and Ruukki's product names are trademarks or registered trademarks of Rautaruukki Corporation.